Bitterroot Elk Project Progress Report
Spring 2013

Montana Fish, Wildlife and Parks and the University of Montana are now completing the second year of a three-year project investigating the influence of predation, habitat, and nutrition on elk population dynamics in the southern Bitterroot Valley. As we approach the end of the second year of intensive elk survival monitoring, we continue to see that lion predation is the dominant cause of elk mortality, and find mortality causes from year two were similar to those observed in year one. Heading into the summer, we will work to capture and radio tag the third and final cohort of neonatal elk, and monitor cause-specific mortality throughout the following year. This summer we also plan to complete the mountain lion population estimate, and the second and final year of vegetation monitoring.

<u>Adult Elk Movements and Survival – Year 2</u>

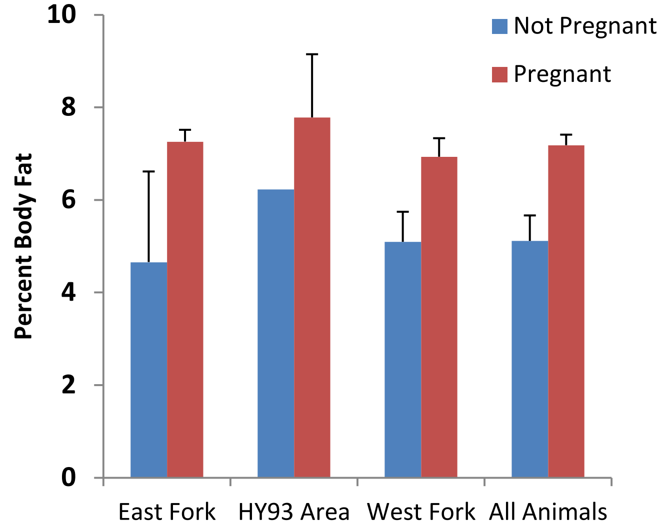
During the winter of 2011-2012, we captured and collared forty adult female elk. GPS collars recorded locations every thirty minutes and the collars dropped off in January 2013. Three animals died of capture related injuries. Over the monitoring period, two additional individuals died out of the remaining 37 collared adult elk. One West Fork elk was killed by wolves and one East Fork elk was killed by a lion.

Two of the animals captured in French Basin migrated over the continental divide to the Big Hole in late April and early May. These cows spent the majority of the summer along the main stem and North Fork of Big Hole River, moving up towards the continental divide in the fall, and finally migrating back to the East Fork and French Basin in late November and early December. Collared animals moved between hunting districts 250 and 270 (crossing Highway 93) both south of Sula and around Rye Creek, but the location data show almost no movement between hunting districts 250 and 270 between Conner and Sula. Several of the animals captured on the CB Ranch, north of Rye Creek, summered further east on public lands than observed during the first year. Most of the seasonal movement in the West Fork was from the lower reaches of various drainages to higher elevation summer ranges. One animal crossed briefly into Idaho near the head of the West Fork, and spent part of the late summer in and around the periphery of the 2011 Mustang Fire. Another crossed over the Bitterroot crest at nearly 8000 feet, spending much of July and August in alpine cirques along the crest, most of which were at or above 7000 feet.

During the winter of 2012-2013, we captured and collared 41 elk. Two of these elk have died. One West Fork elk was killed by a mountain lion in March and another West Fork elk was killed by an unknown predator during April. The remaining elk will be monitored until their collars drop off in January 2014.

Elk Pregnancy Rates and Body Condition

Over the three years of this study, a total of 127 elk were tested for pregnancy. Pregnancy tests are conducted in a laboratory by measuring the level of pregnancy-specific protein B in blood serum. Pregnancy rates averaged 92% in the East Fork (n = 61), 83% in the Highway 93 portion of hunting district 250 (n = 12), and 72% in the West Fork (n = 54). During 2011-2012 and 2012-2013, a sample of elk were tested for pregnancy in late November and a sample were tested in mid-February. Pregnancy rates were similar in both the November and February samples, and we found no evidence for declining pregnancy rates and pregnancy losses over the course of winter.

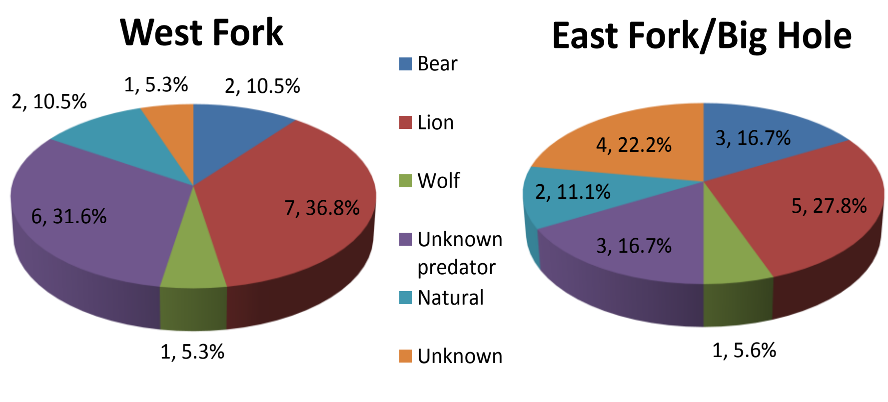


The late-winter percent body fat and pregnancy status of 83 adult female elk during 2011-2013.

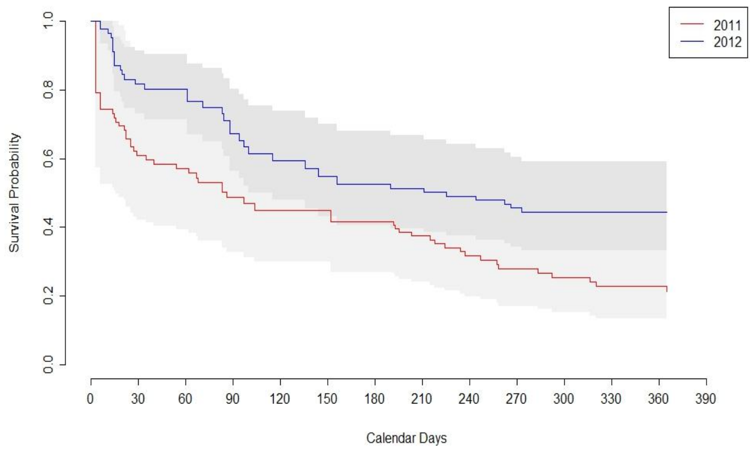
Pregnancy rates varied annually and were related to body condition. We conducted a body condition assessment on each animal to estimate the level of ingesta-free body fat. The level of body fat is an indicator of nutritional condition, and reflects the nutritional quality of elk habitat. Body condition varied annually, and among herds. In both the East Fork and West Fork, body condition was lowest in February 2011 and highest in February 2013. In all years, body condition was lower in the West Fork than in the East Fork. The difference in condition between West Fork and East Fork animals was most pronounced during February 2011, when the winter was severe and all animals were in relatively poor body condition.

Elk Calf Survival - Year 2

In late May and early June 2012, the second cohort of 76 neonatal elk were captured and marked with radio ear tags. The VHF ear tags emit a mortality signal if stationary for more than four hours. Calves have been monitored several times a week using aerial and ground telemetry. When a mortality signal was detected, we located the tag and conducted a thorough investigation of the site as well as a comprehensive onsite necropsy.



Causes of mortality for elk calves May 29, 2012 – May 1, 2013.



Above: The Kaplan-Meier survival estimates for calves in the 2011 and 2012 cohort. Calendar Day 0 represents the day the first calf was captured in each year. The risk from all causes of mortality combined for elk calves was significantly lower in 2012 than in 2011. The risk was significantly greater for male elk calves than for females, and this difference did not depend on the year.

During the summer and early fall of 2012, 18 calves survived, 30 calves died and 28 ear tags failed. The primary cause of mortality was lion predation (n=10). Other sources of summer-fall mortality included bear predation (n =5), wolf predation (n=2), natural causes (n=2), unknown predator (n=7), and unknown cause (n=4). In late-November, we captured and radio ear-tagged an additional 29 elk, bringing the total number of calves being monitored during the winter of 2012-2013 to 47.

Overwinter in 2012-13, 29 calves survived, 7 calves died, and 11 ear tags failed. Causes of overwinter mortality included lion predation (n=2), natural causes (n=2), unknown predator (n=2), and unknown cause (n=1).

This spring, we plan to capture up to 80 neonatal elk calves during late May and early June, and monitor this cohort of calves through May 2014. A new University of Montana Master's student, Dan Eacker, will lead the summer field efforts. This will be the third and final year of the calf survival study.

Mountain Lion Population Research

During the winter of 2012-2013, we initiated a project to estimate mountain lion density using DNA-based mark-recapture methodology. The purpose of the project is to estimate mountain lion density in the study area. The estimated lion density and observed lion-caused elk mortality rate will be used in our elk population modeling efforts to quantify the effects of lion predation on elk population dynamics, and to develop predictions as to elk population dynamics given lower or higher lion densities. Winter field teams worked with houndsmen to tree mountain lions and collect DNA samples using biopsy darting. The overall search effort totaled 705 hours, and 6,020 miles were covered. A total of 52 biopsy, 14 hair, 18 scat, 22 harvest, and 3 management action samples were collected from within hunting districts 250 and 270. DNA analysis to identify lion sex and probability of identity is currently underway. To date, 54 unique lions have been identified in the study area. Additional DNA results are pending.

Wolf Diet Analysis

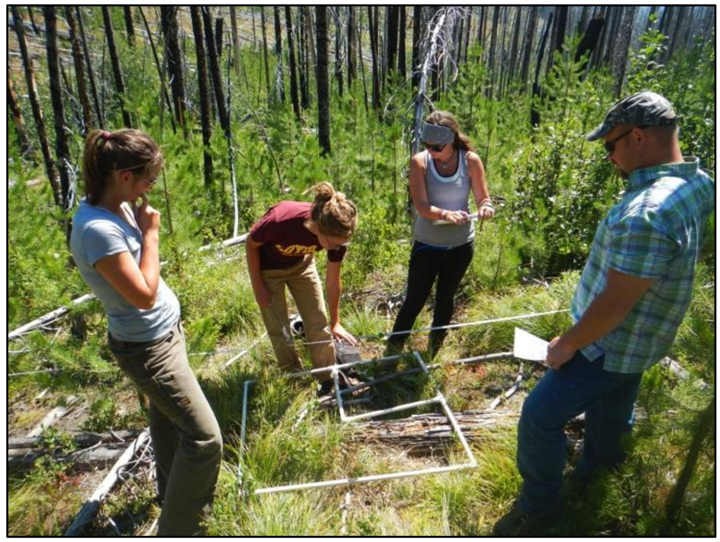
During the summer of 2012, we collected 133 wolf scats from within the study area to investigate prey composition in Bitterroot wolf diet. Scat analysis is the most widely used method to determine diets of carnivores and this approach is inexpensive, relatively quick, and large sample sizes can be collected. Collection occurred primarily at rendezvous sites in the East Fork and West Fork, and opportunistically throughout the study area. Using a microscope to view hair morphology and cuticle scale patterns, the species and age class of prey in the diet can be identified. In the East Fork, adult elk comprised 61%, juvenile elk 20%, adult deer 7%, adult moose 6%, juvenile deer 5%, juvenile moose 1%, and small mammals 2% of wolf ingested biomass during summer. In the West Fork, adult elk comprised 39%, juvenile elk 33%, juvenile deer 11%, adult moose 8.5%, and adult deer 6% of the ingested biomass during summer.

With elk being the primary prey item for wolves during summer in the East Fork and West Fork, why does the cause-specific elk mortality data show such low wolf-specific mortality? Cause-specific mortality and diet studies of predator-prey systems yield different, yet complementary information about wolf-prey systems. Wolf diet results and simple predator-prey models show that it is completely possible that elk are the key prey species for wolves, and yet, because of the relatively low wolf density (relative to elk density and mountain lion density), wolves may comprise a relatively small proportion of the cause-specific mortality of marked elk. Understanding relative densities of predator and prey is crucial in relating cause-specific mortality and diet analysis. Simply put, wolves are eating elk, but the odds of a marked elk being killed by wolves are low. Our ongoing lion density estimation will complement this understanding by allowing us to compare relative wolf and lion densities.

Elk Habitat and Vegetation Monitoring

As part of the Bitterroot elk project, we are assessing forage availability for elk across the study area on private, state, and federal lands. This component of our project is funded primarily by the USFS Region 1, MTFWP, the University of Montana, and NASA. This work has three main components: 1) assessing elk diet during summer and winter by collecting elk pellet samples, 2) assessing elk forage biomass availability across different landcover types during the peak of the growing season in July/August, and 3) assessing forage plant phenology during the growing season from April to October.

For all three research components, the bulk of the previous summer's samples are analyzed over the winter in collaboration with the Washington State University Wildlife Habitat Nutrition Lab (WSU-WHNL). Summer 2012 elk diet analyses using fecal plant fragment analysis are almost complete. With this information we will be able to answer questions about differences in diet between the East Fork and West Fork during summer, as well as guide our forage plant collections for forage quality analyses in the field this summer 2013. In addition, during winter (Jan – Mar) 2013, we collected elk pellet samples from winter ranges in the East Fork and West Fork to be able to understand winter elk diet and potential differences across the study area. Furthermore, plant sample analysis for forage quality (i.e., % digestibility of plant matter) is also currently underway at WSU-WHNL for hundreds of plant samples collected from May – October 2012 from focal plant species preferred by elk.



USFS biologists Eric Tomasik and Andrea Shortsleeve collecting vegetation data in July in a burn in the East fork of the Bitterroot with project vegetation technicians.

Finally, during summer 2012, we collected almost 100 vegetation samples during the peak of the growing season in July and August throughout the summer range of the Bitterroot elk population. These data have been entered and examined over the winter, and we are currently re-assessing our sampling plan for 2013 based on preliminary information from 2012. Given the high variation in post-fire vegetation communities from an elk forage perspective, we expect to focus more on sampling within burned vegetation communities during summer 2013. Additionally, we will be focusing some sampling this summer in the new burns from 2012 to understand responses of elk forage immediately post-fire.

Our plan for summer 2013 is to repeat forage phenology and biomass sampling, with the goal of having 2 vegetation teams collecting forage biomass data during July and August. During Fall 2013 and into 2014, all laboratory analyses will be completed, and we will develop a seasonally dynamic spatial landscape model of elk forage biomass and quality to link to our estimates of elk nutritional condition and our overall project objective of understanding how elk forage affects population dynamics in the Bitterroot.

Acknowledgements

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To learn more, please visit our website:
http://fwp.mt.gov/fishAndWildlife/management/elk/bitterroot/default.html